Proposed MCL's PASSF 1.7v2 11/13/85

9. Zinc

Zinc was also included in the list of IOCs under consideration for Revised Regulations in the ANPRM. The Agency has not identified any adverse health effects that are caused by zinc. The NAS Safe Drinking Water Committee (*Drinking Water and Health*, 1977. Vol. I) concluded that, "zinc is an essential nutrient for humans. There is evidence of borderline deficiencies of the element in children in the United States as well as in other parts of the world . . . . The possibility of detrimental health effects arising from zinc consumed in food and drinking water is extremely remote."

Thus, EPA has concluded that potential adverse health effects will not arise from zinc in drinking water and this compound is not being considered for regulation at the present time.

VIII. Synthetic Organic Chemicals: RMCL's

The ANPRM (48 FR 45502) listed a total of 43 synthetic organic chemicals (SOCs) that were being considered for inclusion in the NPDWR. Inclusion of specific SOCs on the list was based upon the occurrence or potential occurrence of the SOC in drinking water and the potential health effects of exposure to that SOC. Inclusion in the list did not necessarily mean that regulations would be developed for the SOC but that those were the SOCs currently being considered; other SOCs not listed could also be considered and included in the NPDWR. Selection of SOCs for the NPDWR is based upon an analysis of occurrence and potential occurrence, the significance of potential human exposure, associated health effects of exposure and other pertinent factors.

EPA is today proposing to regulate 26 of the 43 SOCs in the ANPRM; five of the SOCs were determined to be inappropriate for regulation due to such factors as lack of potential occurrence in drinking water, lack of actual occurrence data, or insufficient health effects data. Short- and longer-term toxicology assessments have been developed for those five SOCs for which regulations are not appropriate; these assessments may be converted to formal Health Advisories. In addition, 12 SOCs of the 43 SOCs will be reconsidered in later phases of the Revised Regulation development as additional data become available (see Table 1).

RMCLs are proposed for 26 SOCs for which the Administrator has determined that: (1) Analytical methods are available, (2) exposure to any of these SOCs "may have any adverse effect upon the health of persons" and, (3) they occur or are likely to occur in drinking water.

Below are: (1) A summary of the availability of analytical methods, and (2) summaries per SOC of analytical methods, occurrence/exposure and toxicology.

In the MCL proposal, EPA will propose the analytical methods that have been determined to be economically and technologically feasible. In the toxicology discussion for each SOC, the acute and chronic toxic effects of exposure along with any carcinogenicity data are summarized. When data are available, adjusted acceptable daily intakes (AADIs) based on non-carcinogenic effects are determined for long term exposure to the SOCs. In addition, short-term exposure is also considered and short-term assessments are determined for 1-day and 10-day exposures. These assessments are provided for both SOCs for which RMCLs are proposed and for those SOCs for which regulations do not appear to be appropriate. A summary of health-related guidelines prepared by other groups and organizations is provided for each SOC. Values that have been calculated by the World Health Organization (WHO), the National Academy of Sciencies (NAS), EPA's Office of Water Regulations and Standards (OWRS, Water Quality Criteria) and EPA's Office of Pesticide Programs (OPP) have been included. In several instances, these values differ from the proposed AADIs. This is due to several factors, including the use of different uncertainty factors, and reinterpretation of data and varying assumptions. In addition, new data may have become available over the years which has resulted in the derivation of an AADI which differs from older calculated values. Taste and odor threshold values also have been included for certain contaminants.

A summary of the RMCLs and AADIs is presented in Table 12. Risk estimates have been projected using calculation models for SOCs for which data are available and are summarized in Table 13. Short-term assessments and provisional AADIs for SOCs for which RMCLs are not proposed are summarized in Table 14 and short-term assessments for SOCs for which RMCLs are proposed are summarized in Table 15.

A. Availability of Analytical Methods

EPA approved analytical methods are available for most of the SOCs being considered in this RMCL proposal. These methods may involve gas chromatography (GC), gas chromatography/mass spectrometry (CG/MS), and and high pressure liquid chromatography (HPLC).

Purge and trap methods are available for those SOCs that are volatile. Those compounds which are methylene chloride extractable may be analyzed by 600 series methods (i.e., EPA methods for analysis of priority pollutants). Other compounds may be analyzed by newer methods developed recently but not yet approved by the Agency.

Since a number of the 600 series methods have been recently applied to drinking water samples in addition to waste effluent samples, multi-laboratory method validation data are available for many of the compounds in this proposal. Multi-laboratory data from performance evaluation studies are also available for some compounds, using reagent water. For the newer methods, only single laboratory, single operator performance data are available.

TABLE 12.—PROPOSED RMCL'S AND AADI'S FOR SOC'S PROPOSED FOR REGULATION

SOC	Safety factor	AADI [1] (mg/l)	Proposed RMCL (mg/l)
Acrylamide	100	[2] 0.007	0
Alachlor	NA	NA	0
Aldicarb, aldicarb sulfoxide and aldicarb sulfone	100	[2] 0.042	0.009
Carbofuran	100	0.18	0.036
Chlordane	100	0.03	0
cis-1,2-Dichloroethylene	1,000	0.35	0.07
DBCP	NA	NA	0
1,2-Dichloropropane	NA	NA	0.006
o-Dichlorobenzene	1,000	3.12	0.62
2,4-D	100	[2] 0.35	0.07
EDB	NA	NA	0
Epichlorohydrin	100	0.076	0
Ethylbenzene	1,000	[2] 3.4	0.68
Heptachlor	1,000	[2] 0.0025	0
Heptachlor epoxide	1,000	[2] 0.001	0
Lindane	1,000	[2] 0.01	0.0002
Methoxychlor	100	1.7	0.34
Monochlorobenzene	1,000	[2] 3.0	0.06
PCBs	NA	NA	0
Pentachlorophenol	100	1.1	0.22
Styrene	1,000	[2] 7.0	0.14
Toluene	100	10.1	2.0
2,4,5-TP	NA	0.26	0.052
Toxaphene	NA	NA	0
trans-1,2-Dichloroethylene	1,000	0.35	0.07
Xylene	1,000	[2] 2.2	0.44

[1] Does not consider carcinogenicity potential.

[2] These AADIs are termed "provisional" as they were determined from studies of less than lifetime duration (approximately 2 years for an animal study).

Note.—NA=Not available.

AADIs for those chemicals for which RMCLs are not proposed.

Presented in this section are (1) a discussion of analytical methods available for measurement of IOCs and (2) separate discussions for each IOC on (a) the occurrence in drinking water and the relative contributions from drinking water, air and food, and (b) the potential health effects of exposure. In this notice, EPA is presenting a summary of those analytical methods that appear to be available. In the MCL proposal, EPA will propose methods that have been determined to be economically and technologically feasible.

In the discussion of health effects, information on 1-day exposure, 10-day exposure and chronic toxicity effects is included. In addition, a summary of health-related guidelines prepared by other groups and organizations is presented for each IOC. Levels that have been calculated by the WHO, the NAS and EPA's Office of Water Regulations and Standards (Water Quality Criteria) have been included. In several instances, these values differ from the proposed AADIs. This is due to several different factors, including the use of different uncertainty factors, different interpretations of data and varying assumptions. In some cases, new data may have become available resulting in the derivation of an AADI which differs from the earlier calculated values. This section closes with a description of the toxicological basis for the proposed RMCL. This includes calculations of Adjusted Acceptable Daily Intakes (AADI's) for threshold toxicants and, in addition, a risk assessment for substances that are being proposed for regulation as potential human carcinogens. Issues are identified for which public comments are requested on each of the IOCs. The information presented here is summarized from the supporting documents on analytical methods, occurrence, and health effects referenced in Section X.

A. Availability of Analytical Methods

Analytical methods are available for the determination of all the IOCs for which RMCLs are proposed in this notice with the exception of asbestos. Preliminary assessments have been conducted of existing methodologies to determine their suitability in terms of performance, cost, complexity, and other factors such as the availability of trained personnel to conduct the analyses. Specific analytical methods for each contaminant will be proposed as part of the MCL proposal along with specific criteria for the determination of acceptable performance for those laboratories conducting compliance analyses.

TABLE 8.—PROPOSED RMCLS FOR IOCS

IOC	Provisional AADI [4] (mg/l)	Proposed RMCL [5] (mg/l)
Arsenic	0.10	0.050 [1]
Asbestos (medium and long fibers)		7.1 million fibers/liter [6]
Barium	1.8	1.5
Cadmium	0.018	0.005
Chromium	0.17	0.12
Copper	1.3	1.3 [2]
Lead		0.020
Mercury	0.005	0.003
Nitrate	10.0	10.0 [3]
Nitrite	1.0	1.0 [3]
Selenium	0.106	0.045

[1] Based on NAS recommendation and data which suggest that arsenic may be an essential nutrient.
[2] Based on acute toxicity.
[3] Based on acute toxicity for infants up to 3 to 6 months of age.
[4] The AADIs were determined from studies of less than lifetime duration (approximately 2 years for an animal study).
[5] Based upon Provisional AADI with drinking water contribution factored in.
[6] Based upon classification in Category II as a possible carcinogen using a $10\pm^{4}$ cancer in risk level. Limited to fibers longer than 10 um.

TABLE 9.—SHORT-TERM ASSESSMENTS FOR IOCS FOR WHICH RMCLS ARE ALSO PROPOSED

IOC	1-Day (mg/l)		10-day (mg/l)		Longer-term [1] (mg/l)	
	Child	Adult	Child	Adult	Child	Adult
Arsenic	0.05	0.05	0.05	0.05	0.05	0.05
Asbestos	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA
Cadmium	0.043	0.150	0.008	0.029	NA	NA
Chromium (VI)	NA	NA	1.4	5.0	0.24	0.84
Copper	1.3	1.3	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA
Nitrate	NA	NA	[2] 10	111	NA	NA
Nitrite	NA	NA	[2] 1	11	NA	NA
Selenium	NA	NA	0.045	0.144	NA	NA

NA—Not available. Adequate dose-response data are not available. Assessment derived for the next longer duration of exposure is considered to be protective in these cases.
[1] The longer-term numbers are not discussed in the individual *FR Notice* sections but the rationale for the numbers are discussed in the Health Advisory documents.
[2] Based on a 4 kg infant. For rationale see the Health Advisory for nitrate/nitrites.

TABLE 10.—SHORT-TERM ASSESSMENTS AND PROVISIONAL AADIS FOR IOCS FOR WHICH RMCLS ARE NOT PROPOSED

IOC	1-day (mg/l)		10-day (mg/l)		Provisional AADI (mg/l)	Guidance level (mg/l)
	Child	Adult	Child	Adult		
Aluminum	NA	NA	NA	NA	NA	[4] 0.05
Cyanide	NA	NA	0.22	0.75	0.75	0.75
Molybdenum	2.7	9.5	0.27	0.95	0.10	NA
Nickel	NA	NA	1.0	3.5	0.350	[5] 0.150
Silver	NA	NA	NA	NA	0.090	0.090
Sodium						[1] 20
Sulfate						[2] 400
						[3] 250

NA—Not Available. Adequate dose-response data are not available. Assessment derived for the next longer exposure duration is considered to be protective in these cases.
[1] For high risk individuals on sodium restricted diets. EPA will also prepare secondary standards based upon aesthetic quality.
[2] For protection of the infant as a sensitive subpopulation.
[3] Based on taste and odor.
[4] Based upon avoidance of post precipitation in the distribution system. Aluminum would be a candidate for a secondary standard.
[5] Provisional AADI with data on human exposure factored in.

Table 11 provides a listing of several analytical methodologies for the IOCs and estimated detection limits.

Two method validation studies nave been conducted for the furnace atomic absorption (AA) and the inductively coupled plasma (ICP) atomic emission spectrometry techniques. Analytes include all the metals listed in Table 11

TABLE 1.—FINAL RMCLS FOR THE VOCS

Compound [1]	RMCL
Benzene	Zero.
Vinyl chloride	Zero.
Carbon tetrachloride	Zero.
1,2-Dichloroethane	Zero.
Trichloroethylene	Zero.
1,1-Dichloroethylene	0.007 mg/1.
1,1,1-Trichloroethane	0.20 mg/1.
p-Dichlorobenzene	0.75 mg/1/.

[1] The RMCL for tetrachloroethylene was proposed at zero. New toxicological data appear to confirm that zero is appropriate but the public comment period is reopened today for public comment on the new data.

III. Proposed MCLs and Best Technology Generally Available

MCLs are to be set "as close to" the RMCLs "as is feasible". The term "feasible" means "feasible with the use of the best technology, treatment techniques, and other means, which the Administrator finds are generally available (taking costs into consideration)". Section 1412(b)(3).

The general approach to setting MCLs is to determine feasibility of controlling contaminants. This requires an evaluation of: (1) The availability and cost of analytical methods, (2) the availability and performance of technologies and other factors relative to feasibility and identifying those that are "best" and, (3) an assessment of the costs of the application of technologies to achieve various concentrations. Key factors in the analyses include the following:

• Technical and economic availability of analytical methods: precision/accuracy of analytical methods that would be acceptable for accurate determination of compliance, limits of analytical detection, laboratory capabilities, and costs of analytical techniques.

• Concentrations attainable by application of best generally available treatment technologies.

—Levels of VOC contamination in drinking water supplies.

—Feasibility/reliability of removing VOCs to specific concentrations.

• Other feasibility factors relating to the "best" means of treatment such as air pollution and waste disposal and effects on other drinking water quality parameters.

• Costs of treatment to achieve contaminant removal.

Proposed MCLs for the eight VOCs are presented in Table 2; the MCLs were determined based upon the following key factors:

• Best technologies generally available are packed tower aeration and granular activated carbon (GAC) adsorption.

• Raw water VOC removal of 90 to 99 percent (and 90–99.9% for vinyl chloride) is a reasonable expectation of performance by packed tower aeration and GAC adsorption.

• The Practical Quantitation Level (PQL) for the VOCs is 5 μg/l except for vinyl chloride which has a PQL of 1 μg/l. The PQL is defined as the lowest achievable level of analytical quantitation during routine laboratory operating conditions within specified limits of precision and accuracy.

Provided below are summaries of the availability of analytical methods, treatment technology performance and costs, and the rationale used to determine the proposed MCLs. A more complete explanation is found in the Cost and Technologies document and the Analytical Metheds/Monitoring document listed in the end of this notice.

TABLE 2.—PROPOSED MCLS

Compound [1]	MCL mg/l
Trichloroethylene	0.005
Carbon tetrachloride	0.005
Vinyl chloride	0.001
1, 2-Dichloroethane	0.005
Benzene	0.005
1,1-Dichloroethylene	0.007
1,1,1-Trichloroethane	0.20
p-Dichlorobenzene	0.75

[1] The MCL for tetrachloroethylene will be proposed later—see text, Section II—Background.

A. MCL vs. Treatment Technique Regulation

The SDWA specifies in section 1401 that an MCL is to be set for contaminants in drinking water if "it is economically and technologically feasible to ascertain the level of such contaminant in water in public water systems." If it is not, a treatment technique regulation is to be set.

For the purposes of making the finding regarding the feasibility of monitoring for any given contaminant, EPA must first determine, with respect to a given contaminant, what effective analytical techniques, if any, are technologically available. Next EPA must determine at what frequencies those techniques should be employed to assure detection of any violation prior to the time the violation will actually cause or contribute to any significantly increased health hazard. Then EPA must determine whether monitoring at that frequency is economically feasible. H.R. 93–1185, 93rd Cong. 2d Sess. at 11–12 (1974).

In this proposal, three analytical techniques have been identified and are clearly technologically available. As discussed in Section IV, EPA is proposing to require monitoring quarterly where VOCs are detected. This monitoring frequency will detect violations of the MCL before there is any significantly increased health hazard, as VOCs present only potential long-term risks at the concentrations normally found in drinking water. Quarterly reporting is also proposed to account for the data which suggest that VOC raw water concentrations may vary under some circumstances. At $150 to $200 per sample, quarterly monitoring is economically feasible for public water systems. For example, monitoring costs for a system serving 100 people with two wells would be a total of $1 per month per person for one year. For a system of 25 people with one well, costs would be $2 per month per person for one year. Costs for larger systems would be much less. Monitoring on a daily or weekly basis might not be economically feasible in all cases. Monthly monitoring might be economically feasible for larger communities but would not generally be necessary to detect significantly increased health hazards given the long-term risks from VOCs.

Although VOCs can sometimes be reduced below the practical quantitation level using best generally available technology (BGAT), EPA does not believe a treatment technique should be required instead of an MCL. First, Congress requires EPA to set a treatment technique instead of an MCL when monitoring is not economically and technologically feasible. EPA believes that Congress intended EPA to require use of treatment techniques whenever a method was substantially infeasible across a broad range of contamination levels. In this case, monitoring is economically and technologically feasible across a very broad range of contamination levels.

Second, if a treatment technique were proposed for the VOCs, it would have to be based on a treatment performance measurement parameter which is more sensitive than the analytical test methods for VOCs. There is no known parameter and its development is not foreseeable in the near future. Similarly, if EPA were to prescribe a treatment technique for VOCs, there would still remain the question of whether an individual system would have to implement the prescribed technique. EPA can only identify those systems that need the treatment technique by having the systems monitor for the VOCs. Obviously, monitoring data are only valid above the verifiable level of quantitation, and only those systems with VOC contamination at or above the verifiable level would have to install the technique. Therefore, setting the MCL at the limit of quantitation provides

State that the treatment technique is not necessary to protect the health of persons because of the quality of the raw water source of the system. Criteria would be provided in the regulation which the system must meet in order to receive a variance.

The practice of filtering surface water is supported by a number of professional groups such as the AWWA: "The American Water Works Association (AWWA) strongly supports the practices of filtration of surface water used as sources of public water supply, disinfection of public water supplies, including the maintenance of residual disinfection in the distribution system, ..." (AWWA, 1983. AWWA Officers and Committee Directory, Policy Statements and Official Documents. p. 74). In addition, a workshop convened by the EPA's Office of Drinking Water, in conjunction with the American Society for Microbiology, to advise EPA on a variety of drinking water issues, strongly recommended the filtration of surface waters (Assessment of Microbiology and Turbidity Standards for Drinking Water, Dec. 2–4, 1981, July 1983, EPA 570–9–83–001).

Public comment is requested on the following:

• Should a treatment technique requirement be established such that system using surface waters would be required to use filtration and disinfection? Upon what basis?

• What specific filtration and disinfection technologies should be included in the definition of a "filtration" and "disinfection"? For example, direct filtration? slow sand filtration?

• Should these treatment requirements apply to non-community drinking water systems?

• What criteria should be specified that would provide guidance in the issuance of variances?

2. Mandatory Disinfection of Ground Water

EPA may also propose, in the next rulemaking, a treatment regulation requiring the disinfection of all ground waters before distribution to the consumer. Many of the same microorganisms that occur in surface waters are also found in ground waters. Because a search for each pathogen is not technically or economically feasible, and because the presence of some are not adequately signalled by the presence of coliforms, a treatment technique regulation may be proposed. Filtration of ground water supplies, while encouraged, may not be proposed as a requirement because the soil acts as a natural filter, thereby usually reducing microbial and particulate contamination of the underlying water.

The number of reported disease outbreaks and cases associated with untreated ground water supplies are substantially greater than those for treated ground water supplies. According to published data, communities served by untreated ground water have had 3.7 times as many cases of illnesses. Between 1971–1982, untreated well water was associated with 110 disease outbreaks and over 8500 cases of illnesses. If untreated spring water is added to this total, the values are 126 outbreaks and over 9800 cases. In 1982, untreated ground water was responsible for 28 percent of all reported waterborne disease outbreaks and 10 percent of all waterborne illnesses. The etiological agents implicated in these outbreaks were the hepatitis A agent, *Yersinia*, and *Giardia;* in 5 outbreaks the agent was not identified.

Adequate disinfection reduces contamination continuously and deals with periodic contamination. Similar to surface waters, monitoring for contamination is necessarily intermittent, especially for small systems. Moreover, in 1982, about 24 percent of the utilities violated coliform monitoring requirements at least intermittently and 14 percent violated turbidity monitoring requirements.

A variety of disinfectants are available. Currently, the best are chlorine (as hypochlorous acid), ozone, and chlorine dioxide. All three have excellent biocidal activities against bacteria and viruses. For inactivation of protozoan cysts, ozone is excellent, chlorine has only moderate biocidal activity, and no published data are yet available for chlorine dioxide. Chlorine and chlorine dioxide residuals can persist in the distribution system, ozone residuals cannot. Besides these three disinfectants, others are being used or have been suggested for use. These include chloramines, iodine, bromine, and ultraviolet light. A treatment regulation will recommend the types of disinfectants appropriate for use, the range of acceptable disinfectant concentrations, minimum contact times, and possibly the minimum and maximum residual concentrations in the distribution system. Variances would be considered in those cicumstances where a system is able to demonstrate to the satisfaction of the State that the source water is of sufficiently good quality to obviate the need for disinfection. Like the surface water regulation, criteria to assist in making variance determinations would be provided if a regulation is proposed.

Public comment is requested on the following:

• Should a treatment technique requirement be established such that systems using ground water would be required to provide disinfection? Upon what basis?

• What specific disinfection technology should be included in the regulation?

• Should these treatment requirements apply to non-community drinking water systems?

• What criteria should be specified for the issuance of variances?

VII. Inorganic RMCLs

The Interim Regulations contain MCLs for the following ten inorganic chemicals:

Contaminant	MCL, mg/1
Arsenic	0.05
Barium	1
Cadmium	0.010
Chromium	0.05
Fluoride	1.4 to 2.4, depending on climate.
Lead	0.05
Mercury	0.002
Nitrate (as N)	10
Selenium	0.01
Silver	0.05

Monitoring and reporting requirements were also included in the Interim Regulations for sodium and corrosion.

The ANPRM (48 FR 45502) listed 23 IOCs under consideration for Primary Drinking Water Regulations. RMCLs are proposed for 11 IOCs (one of which was not listed in the ANPRM—nitrite), one IOC (fluoride) will be included in a separate proposal, and 6 IOCs (cyanide, molybdenum, nickel, silver, sodium, and sulfate) have been determined inappropriate for regulation based upon limited health effects data and/or occurrence in drinking water. Five IOCs (antimony, beryllium, thallium, vanadium and aluminum) will be addressed at a later date and one IOC (zinc) has been determined inappropriate for regulation based upon EPA and the National Academy of Sciences (1977 and 1980) reviews.

For the 11 inorganic chemicals for which RMCLs are proposed, the Administrator has determined that human exposure to these IOCs in drinking water may have an adverse effect upon the health of persons.

Table 8 presents the proposed RMCLs for the 11 IOCs. Table 9 summarizes the short-term assessments for those chemicals for which RMCLs are proposed and Table 10 summarizes the short-term assessments and provisional